

component and a mounting face positionabl adjacent a substrat ;

at least one contact xt nding [between] through said housing, having a free-standing portion extending from said mating face [and said mounting face of said insulative housing] and including a tail portion; and

a solder mass [secured] fused to said tail portion [for] prior to securing the electrical connector to the substrate so that at least a portion of said solder mass is located further from said housing than said contact.

Add the following new claim 41.

-- 41. (Newly Added) The electrical connector as recited in claim 1, wherein the signal contacts are one of blade-type and dual beam-type contacts. --

### REMARKS

The Office action objected to the specification and drawings; and rejected the claims under 35 U.S.C. §§ 102, 103 and 112. Applicants cancelled claims 3 and 21; amended claims 1, 4, 14, 15, 18, 26, 29 and 32; and added new claim 41. Claims 1, 2, 4-20 and 22-41 remain. Applicant requests that the Examiner reconsider and withdraw the objections and rejections. A Proposed Drawing Correction and a Petition for a two month extension of time accompany this Reply as separate papers.

### Objection to Specification

The Office action objected to the Abstract for failing to set forth the basic aspects of the invention being claimed. Applicants resp ctfully disagree. Th Abstract mirrors the features of the independent claims as originally recited. Thus, th Abstract, as it now

appears, must set forth the basic aspects of the invention being claimed. Applicants request that the Examiner reconsider and withdraw the objection.

### **Status as Continuation Application**

The Office action objected to the designation of the present application as a continuation of U.S. Patent Application serial number 08/903,762 (which is a continuation of 08/842,197, which is a continuation of 08/452,020). Specifically, the Office action states that the parent cases do not mention "solder masses."

Applicants believe that the designation of the present application as a continuation is proper. Applicants point out the portion of the specification entitled "BALL GRID ARRAY CONNECTOR" beginning on page 13, line 18 of each of the earlier applications (08/903,762, 08/842,197 and 08/452,020). Applicants assert that one of ordinary skill in the art would inherently recognize that the phrase "ball grid array" refers to the use of masses of solder. Furthermore, Figures 25-27 and 29-33 of each of the earlier applications display masses of solder - in particular solder balls. Accordingly, Applicants ask that the Examiner reconsider and withdraw the objection.

### **Objection to Drawings**

The Office action objected to Figures 26 and 27 for not including reference character 424. Applicants point out that reference character 424 appears in Figures 26 and 27.

The Office action stated that the lead line for reference character 460 appeared incorrect. Applicant corrected the specification. Thus, reference character 460 in Figure 28 designates a "peripheral bevelled edge." Applicant also added reference character 460 to Figure 31 as suggested by the Examiner. This change appears in the

**Proposed Drawing Correction.**

The Office action suggested providing reference characters to Figures 32 and 33 to designate the various features of the contacts. Applicant added the reference characters as suggested by the Examiner. Figures 32 and 33 now clearly identify the "angled portion 453" of contact 434 which resides in "a recess 455" in the base of plug 420. The angled portion of the contacts receive "solder balls 452, 454." Also, the figures clearly identify the "angled portion 457" of contact 470 which resides in "a recess 459" in the base of receptacle 456. The angled portion of the contacts receive "solder balls 488, 490."

The Office action stated that reference character 470 in Figures 28 and 30 designates the wrong feature. Applicant respectfully disagrees. Reference character 470 in Figures 28 and 30 designate "a metallic pin receiving recess."

**Claim Rejections - 35 U.S.C. § 112**

The Office action rejected claims 1-40 as lacking enablement. Specifically, the Office action stated that the original disclosure does not describe solder masses/balls. Applicants respectfully disagree. The portion of the specification entitled "BALL GRID ARRAY CONNECTOR" beginning on page 13, line 18 of each of the earlier applications (08/903,762, 08/842,197 and 08/452,020) provides support for all of the features recited in claims 1-40. Applicants assert that one of ordinary skill in the art would inherently recognize that the phrase "ball grid array," in combination with Figures 25-27 and 29-33 which display solder balls, provides an enabling disclosure for the recitation of masses of solder in the claims. Accordingly, Applicants ask that the Examiner reconsider and withdraw the rejection.

The Office action also indicated that the specification does not provide antecedent basis for the terms "mounting surfaces," "substrates," "angled portions" and "processes" that appear in claim 13. Applicants clarified the specification to provide antecedent basis for these terms. Applicants did not introduce new matter. Support for the changes appears, for example, in Figures 25-27 and 29-33. Applicants request that the Examiner reconsider and withdraw the rejections.

The Office action also indicated that the specification does not provide antecedent basis for the solder balls being "reflowable." Applicants respectfully disagree. The portion of the specification beginning on page 13, line 18 of each of the earlier applications (08/903,762, 08/842,197 and 08/452,020) is entitled "BALL GRID ARRAY CONNECTOR." Applicants assert that one of ordinary skill in the art would inherently recognize that reflow of the solder masses occurs when mounting a "ball grid array" assembly to a substrate. Accordingly, Applicants ask that the Examiner reconsider and withdraw the rejection.

The Office action also stated that the specification does not provide support for the features of claims 27, 28, 35, 36, 39 and 40. Applicant respectfully disagrees. Support for claims 27 and 40 appears, for example, in Figures 28 and 30-33. Support for claim 28 appears, for example, in Figures 30 and 31. Support for claim 35 appears, for example, in Figures 26, 27 and 30-33. Support for claim 39 appears, for example, in Figures 32 and 33.

As for claim 36, Applicants believe the original disclosure inherently disclosed this feature. As now shown in Figures 27 and 31, the angled portions (reference characters 453, 457 seen more clearly in Figure 33) of contacts 434, 470 are parallel to a substrate

to which the connector mounts. Applicant requests that the Examiner reconsider and withdraw the rejections.

The Office action also stated that the original disclosure did not describe "coupling" as recited in claim 5 and that claim 5 was unclear. Applicants respectfully disagree. As shown in Figures stated on page 2, lines 7-15 of each of the earlier applications:

[t]he concept behind the I-beam geometry is the use of strong dielectric loading through the structural dielectric to ground on the top and bottom of the mated contact edges and a relatively light loading through air on the mated contact sides. These different dielectric loadings are balanced in such a way as to maintain a controlled impedance and yet minimize coupling (and cross talk) between adjacent contacts. In this way, all lines of the interconnect can be dedicated signals while maintaining a controlled impedance and a relatively low rise time-cross talk product of less than 1 nanosecond percent. (Emphasis added)

Thus, Applicants request that the Examiner reconsider and withdraw the rejections.

The Office action rejected claim 15 as being indefinite. Applicants amended claim 15 to recite "said dielectric base." Claim 1 provides antecedent basis for this feature. Applicants request that the Examiner reconsider and withdraw the rejection.

#### **Claim Rejections - 35 U.S.C. § 102**

The Office action rejected claims 18-40 as being anticipated by any of U.S. Patent number 4,678,250 to Romine *et al.* (hereinafter Romine), 5,593,322 to Swamy *et al.* (hereinafter Swamy), 5,258,648 to Lin (hereinafter Lin), 4,679,889 to Seidler (hereinafter Seidler) and 4,767,344 to Noschese (hereinafter Noschese), or the advertisement by Teka (hereinafter Teka)<sup>1</sup>.

As to claims 18-31, Applicants believe that none of the cited references disclose or

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<sup>1</sup> The Office action states, alternatively, that claims 18-40 are obvious over any of Romine, Swamy, Lin, Seidler, Noschese and Teka in view of U.S. Patent number 4,695,106 to Feldman *et al.* (hereinafter Feldman).

suggest all of the features of independent claim 18 as now written. For instance, Lin and Swamy fail to disclose "continuous contacts ... extending through [the] housing." Lin describes an interposer (22) for a semiconductor die (12) which uses pads 27, traces 26 and vias 24. Swamy describes conductive strips 206, vias 208 and pads 210. None of the remaining cited references provide a motivation for such a modification.

In addition, Seidler, Romine, Noschese, Teka and Feldman fail to disclose "contacts disposed in an array of at least three rows and at least three columns." Seidler, Romine, Noschese, Teka and Feldman all disclose connectors with only two rows of contacts. With only two rows of contacts, all of the contacts are located at an "outside" position on the connector. At "outside" positions, the solder joints between the contact and the substrate can be easily inspected and readily cleaned. Thus, none of the remaining cited references provide a motivation for such a modification.

As to claims 32-40, Applicants believe that none of the references disclose all of the features of independent claim 32 as now written. For instance, Swamy, Lin and Teka fail to disclose a contact with "a free-standing portion extending from" the mating face of the housing.

In addition, Seidler, Romine and Feldman fail to disclose a solder mass fused to the contact "prior to securing the electrical connector to the substrate." The solder used to secure the connectors of Seidler, Romine and Feldman to the substrate is not fused to the contacts until after the connector is placed on the substrate.

Finally, Noschese fails to disclose a solder mass fused to the contact before mounting to the substrate so that "at least a portion of said solder mass is located further from said housing than said contact." None of the remaining cited references

provide a motivation for such modifications. Therefore, Applicants request that the Examiner reconsider and withdraw the rejection.

### **Claim Rejections - 35 U.S.C. § 103**

The Office action rejected claims 1-40 as being unpatentable over any of Feldman, U.S. Patent number 5,046,960 to Fedder (hereinafter Fedder), 5,174,764 to Kandybowski *et al.* (hereinafter Kandybowski) and 5,120,232 to Korsunsky (hereinafter Korsunsky) in view of any of Noschese, Swamy, Romine, Teka, Lin, Seidler and the Electronics article (hereinafter Electronics).

Applicants believe that the cited references neither disclose nor suggest all of the features of the claims. As for claims 1-17, Feldman, Kandybowski and Korsunsky fail to disclose or to suggest that the mating portion of the signal contacts have "an elongated cross-section" as described in independent claim 1. In addition, Fedder fails to disclose or to suggest that the mating portion of the signal contacts is "generally planar" as described in claim 1. None of the remaining cited references provide a motivation for these modifications.

As for claims 18-40, the cited references fail to disclose or to suggest all of the features of the "ball grid array connector" recited in independent claim 18 and of the "electrical connector" recited in independent claim 32.

The Office action rejected claims 1-40 as being unpatentable over Romine in view of any of Fedder, Feldman, Noschese, Seidler, Electronics, Teka, Lin and Swamy. Applicants believe that none of the cited reference disclose or suggest all of the features of the claims. As for claims 1-17, Romine fails to disclose or to suggest the orientation of the ground and signal contacts as described in independent claim 1.

As for claims 18-31, Romine fails to disclose a ball grid array connector with an array of contacts in at least three rows and columns as described in independent claim 18. As for claims 32-40, Romine fails to disclose that the solder mass is fused to the contact before the connector mounts to the substrate as described in independent claim 32. The remaining cited references fail to provide a motivation for such modifications.

#### **Other Claim Amendments**

Applicants made several changes to the claims that were neither in response to an objection nor a rejection. For example, Applicants removed unnecessary features from claims 1 and 32 (using - -mating component- - rather than "mating connector") and claim 18 (using - -mating component- - rather than "mating connector" and deleting "apertures"). Applicants also corrected antecedent basis problems in claims 14, 18, 26 and 29. Finally, Applicants modified claim 4 to depend from a non-cancelled claim.

#### **Newly Added Claims**

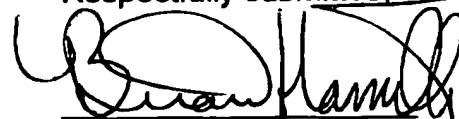
Applicants added new claim 41. Claim 41 defines an invention that is patentable over the cited references. Applicants did not introduce new matter. Support for the features of claim 41 appears, for example, in Figures 30 and 32.

#### **Conclusion**

In light of the foregoing, Applicants submit that the claims are now in condition for allowance. Applicants request reconsideration and withdrawal of the objections and rejections. Applicants solicit the allowance of claims 1, 2, 3-18 and 20-41 at an early date.



Respectfully submitted,



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